

Central City / Clear Creek Superfund Site



North Clear Creek
Water Treatment Plant

March 2012

Background

- State Lead Site - Colorado
- Historic gold mining and milling area
- 30 miles west of Denver
- 400 square mile Clear Creek watershed
- Mega Site \$ xx,000,000 spent to date
- Four Operable Units
- OU4 focused on North Clear Creek
- Listed on NPL in 1983
- Nearing Completion

	Site Activities
Removal	Virginia Canyon – 6 waste piles closed in place
	Hazardous waste responses
OU1	Deferred to OU3
OU2	4 waste piles closed in place
OU3	Argo Tunnel WTP - Argo Tunnel, Big Five Tunnel, Virginia Canyon GW
	11 waste piles closed in place
	Sampled 60 domestic wells, treatment systems installed at 4 homes
	Argo RSE - Argo Tunnel Bulkhead, HDS conversion
OU4	2 sediment retention dams, 2 check dams
	14 waste piles closed in place
	8 waste piles relocated to on-site repository
	NCC stream stabilization, relocation of tailings to on-site repository
	Mine drainage pipeline
	Quartz Hill waste pile in place closure
	NCC WTP - Gregory Incline, National Tunnel, Gregory Gulch

Site Risks Summary

Media

Tailings, Waste Rock, Sediments, Surface Water, Groundwater

Contaminants of concern

Human health risks: Arsenic, Lead

Ecological risks (aquatic life): Zinc, Copper, Cadmium, Manganese

Exposure Pathways

Inhalation: airborne dust

Dermal Contact: low pH water

Incidental Ingestion: recreationalists

Food Chain: consumption of fish

Ingestion of municipal water: drinking water source for 300,000+

Operable Unit 4 ROD:



Remediation goals:

- Promote brown trout survival in North Fork; and
- Allow for a viable, reproducing brown trout population in Clear Creek.

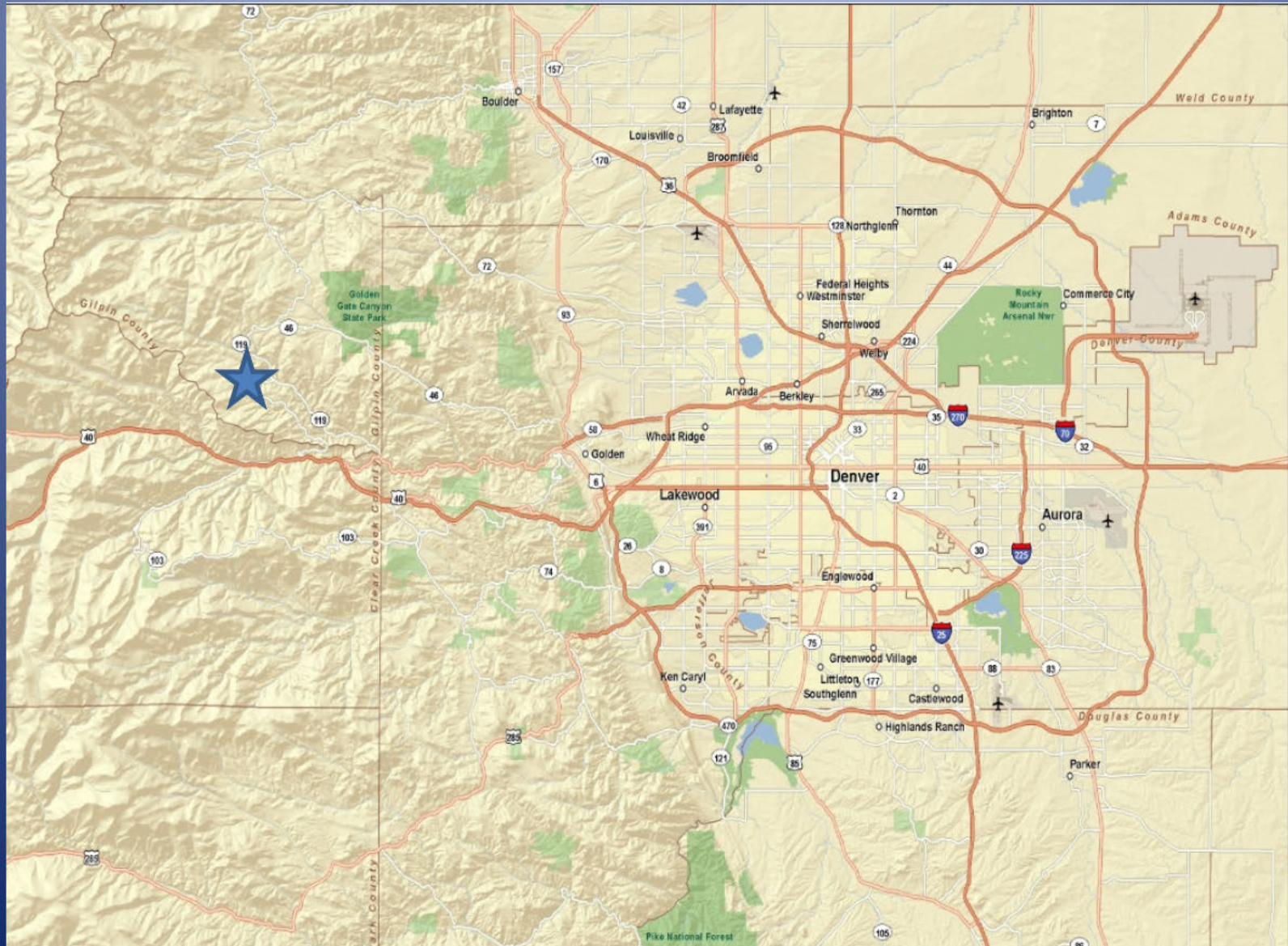
Remedial action objectives:

- Treat acid mine drainage; and
- Reduce runoff from tailings/waste rock piles to minimize ground and surface water contamination.

Remedial Action Costs

Activity	Cost	Schedule
Capital Construction	\$16,000,000	August 2012 – May 2014
Contract Administration	\$800,000	August 2012 – May 2014
Special Inspections	\$100,000	August 2012 – May 2014
Furnishings	\$200,000	January 2014 – May 2014
Personal Services / Indirect	\$600,000	August 2012 – May 2014
Operational costs through O&F determination	\$1,500,000	March 2014 – February 2015
Total	\$19,200,000	

Site Location



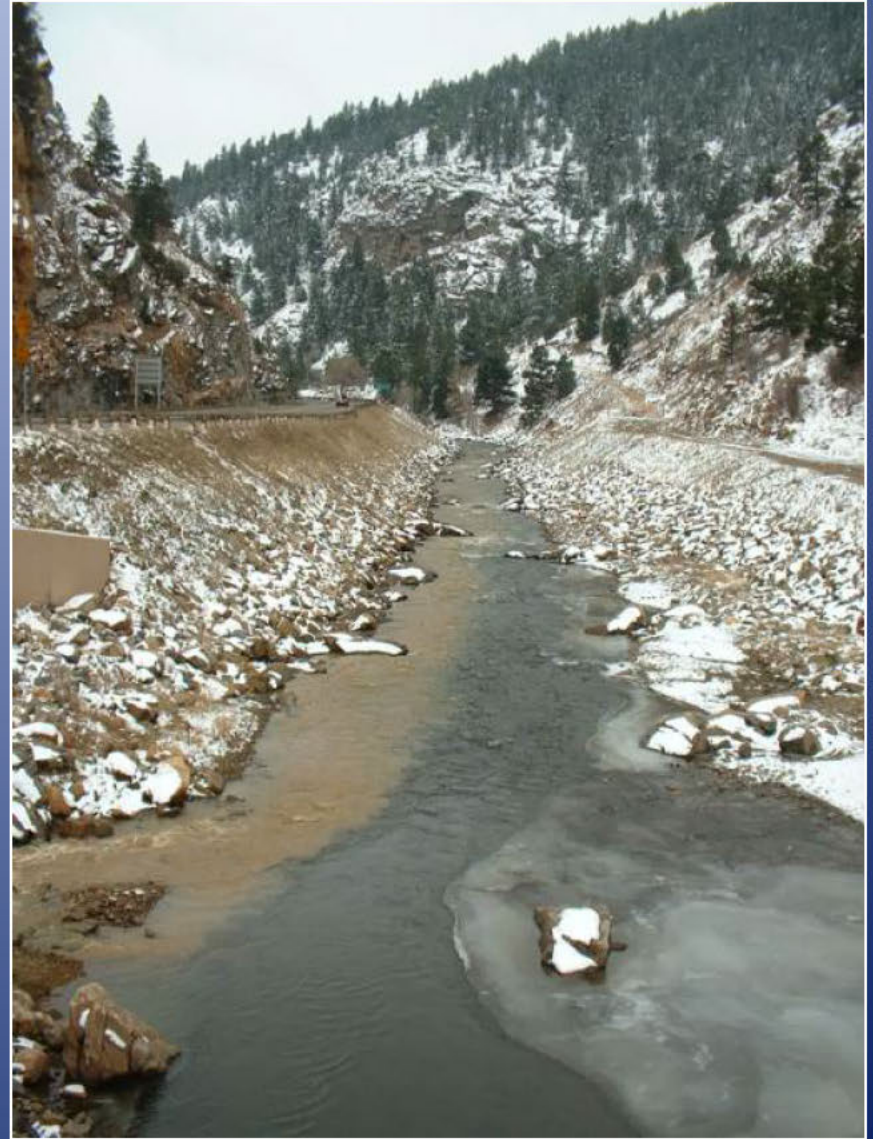
CC/CC OU4 Source Water Features



Contaminated Water

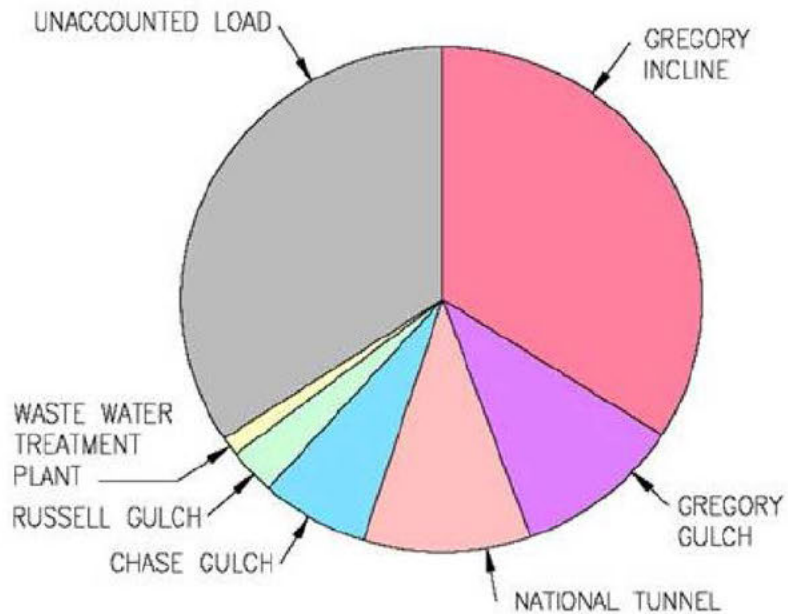


Impacts to North Clear Creek, mainstem Clear Creek

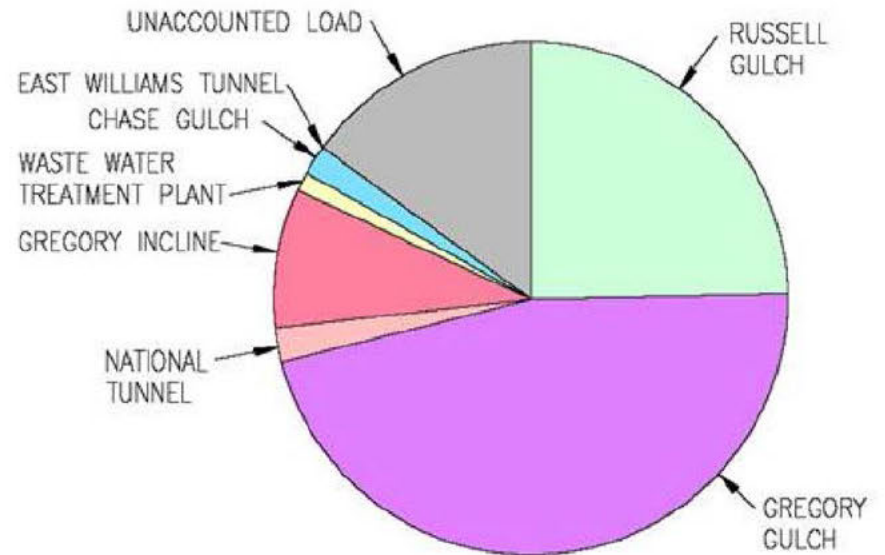


Sources

Low Flow



High Flow



Approximate Source Contribution to Sum of Loads
Measured Along North Clear Creek

Site Location



Special Requirements

Coordination with Colorado Department of Transportation,
City of Black Hawk

Adjacent to active roadway

Multiple sources, variable flows

Small footprint, ≈ 1 acre

National Historic Landmark District



60% Design



Human Exposure

Media

- Tailings / waste rock piles
- Groundwater
- Sediments
- Surface water

Exposure Routes

- Inhalation
- Ingestion - incidental and municipal
- Dermal contact

Contaminants of Concern

- Arsenic
- Lead

Human Exposure cont.



Site Uses

Rafting
Kayaking
Fishing
Gold panning
Drinking water

Estimate of Exposure

Assumes linear increase

25 people per year exposed to contaminated soils

100 people per year exposed to contaminated sediments

500 people per year exposed to contaminated surface
water

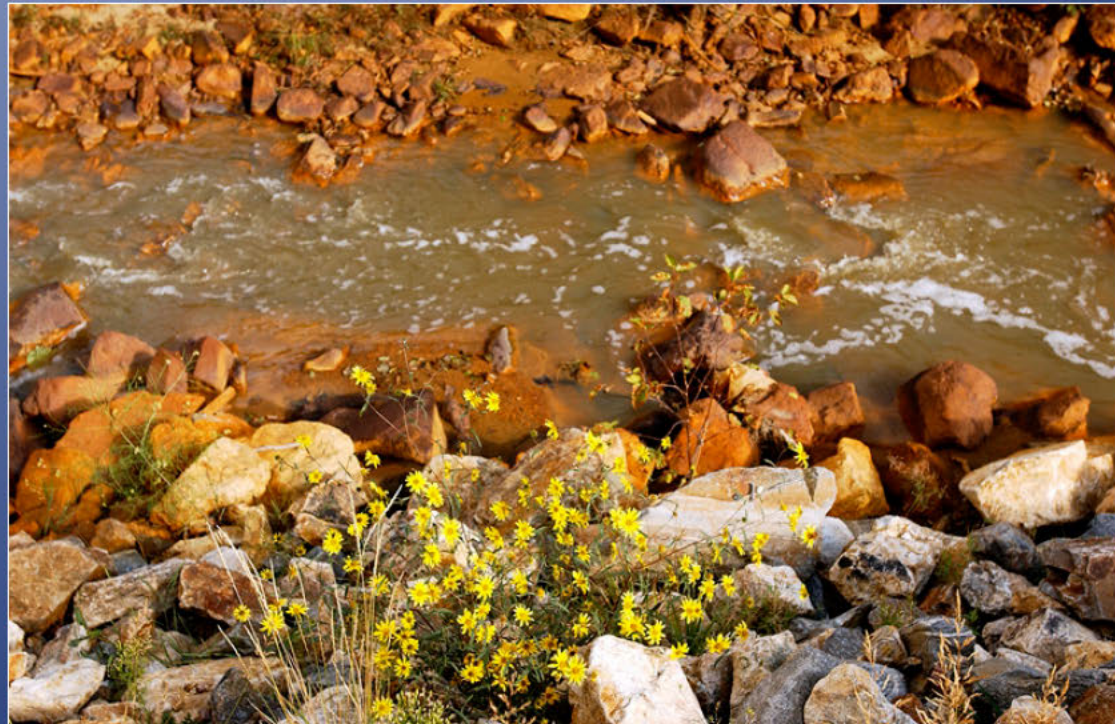


Contaminant Stability

Acid mine drainage discharges into North Clear Creek, a tributary to mainstem Clear Creek

Clear Creek is a drinking water supply to over 300,000 Denver metropolitan area residents

Surface water aquatic life standards are exceeded for Al, Cd, Cu, Fe, Mn and Zn



Contaminant Characteristics

Contaminant	Average concentration ug/L	Maximum concentration ug/L	Remediation Goal ug/L	
			High Flow	Low Flow
Zinc	7,400	30,000	381	675
Cadmium	1,000	12,000	1.9	3.5
Copper	24	170	7.4	15.1
Manganese	15,000	46,000	1,531	2,021

Remedial goals for North Clear Creek were established based on average hardness during high and low flow regimens.

Goal is to promote brown trout survival in North Fork and allow for a viable, reproducing brown trout population in Clear Creek.

Contaminant Characteristics cont.

Hazard Indices for North Clear Creek range from 23.0 just below the mine discharges to 1.2 at the mouth, 8 miles downstream

Toxicity testing shows 100% mortality to water fleas and 50% mortality to Fathead Minnows. Trout are generally more sensitive to metal toxicity than Fathead Minnows.



Below the acid mine drainage discharges, North Clear Creek is acutely toxic to trout and macroinvertebrates

Chronic reproductive effects are observed within mainstem Clear Creek below the confluence of North Clear Creek

Ecological Threats

North Clear Creek and mainstem Clear Creek are designated as Aquatic Life Cold Water Fisheries

North Clear Creek has no fish present for several miles below the discharges, and fish populations are depressed in Clear Creek below the confluence



Programmatic Considerations

State Lead

Strong community support

- North Clear Creek Mitigation Advisory Committee
- Upper Clear Creek Watershed Association
- Trout Unlimited
- Colorado Department of Parks and Wildlife
- Gilpin County
- City of Black Hawk



Money already invested



- Pipeline Design	\$ 242,000
- Pipeline Construction	\$ 1,812,000
- Site Design	\$ 150,000
- Site Construction	\$ 2,500,000
- WTP Design	\$ 1,206,000
TOTAL	\$ 5,910,000

Questions?

